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## A BOX-TYPE TRAP TO AID IN THE CONTROL OF EYE GNATS AND BLOWFLIES

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In the course of investigations of the eye gnat, *Hippelates pusio* Loew, a veritable scourge of man, in Coachella Valley, Calif., a new trap for capturing these insects was developed. The first traps were constructed entirely of glass set in wooden frames. Traps were later constructed of wood, iron, and screen cloth, or a combination of all these and glass. The latter type of trap has been used three seasons experimentally, and during the last two seasons the same type of trap has been developed in several sizes for catching blowflies. At the present time this type of trap is the principal reliance for control of eye gnats in Coachella Valley, where the eye-gnat population has apparently been decimated during the last two seasons by systematic use of the trap. It is thought that the blowfly trap will be found useful on ranches of the Southwest where blowflies are troublesome.

### MAIN FEATURES OF THE TRAP

The main features of this type of trap are: (1) Large quantities of baits can be used to disseminate odors without requiring the hovering insects, such as eye gnats, to enter the region where odors are so concentrated as to appear to be more or less repellent; (2) immature insects breeding in the baits are prevented from escaping; (3) both chemotropic and phototropic responses of insects can be utilized; (4) the trap can be adapted to permit insects to enter it without entering the bait chamber; (5) it can be constructed in sizes large enough to handle large carcasses on ranches where it is not feasible to burn the dead animals and in places where it would be advantageous to use large quantities of garbage for baits until it could otherwise be disposed of; (6) the odors are disseminated by currents of air which forcibly enter the bait chamber through the funnel-shaped openings; (7) it may be possible to utilize the trap in breeding a continuous supply of parasites and predators of the insects to be controlled.

Several traps of this type, in different sizes, have been constructed and tested under different conditions for both eye gnats and blowflies, as well as house flies. The list of materials and instructions for constructing a blowfly trap (fig. 1, A) 42 inches wide, 60 inches long, and 77 inches high, inside measurements, are contained in a mimeographed circular (E-299) which will be sent on application to the Bureau of Entomology, United States Department of Agriculture, Washington, D. C. This circular also shows modifications of this trap for use against eye gnats.

### ADAPTATION OF BOX-TYPE TRAP FOR TRAPPING EYE GNATS

The eye-gnat trap (fig. 1, B) is fundamentally the same as the blowfly trap, with modifications that adapt it to the habits and size of eye gnats. The trap illustrated is 48 inches wide, 74 inches long, and 103 inches high.

The writer's investigations have indicated that stirring the baits, especially liquid baits such as are used for eye gnats, greatly increases the catch. Late in the season of 1930 a windmill bait agitator was developed and tested. While it was obvious that eye-gnat catches were materially increased and there was a marked increase in blowfly catches, no conclusive comparative data were obtained. These agitators are quite simple and inexpensive.



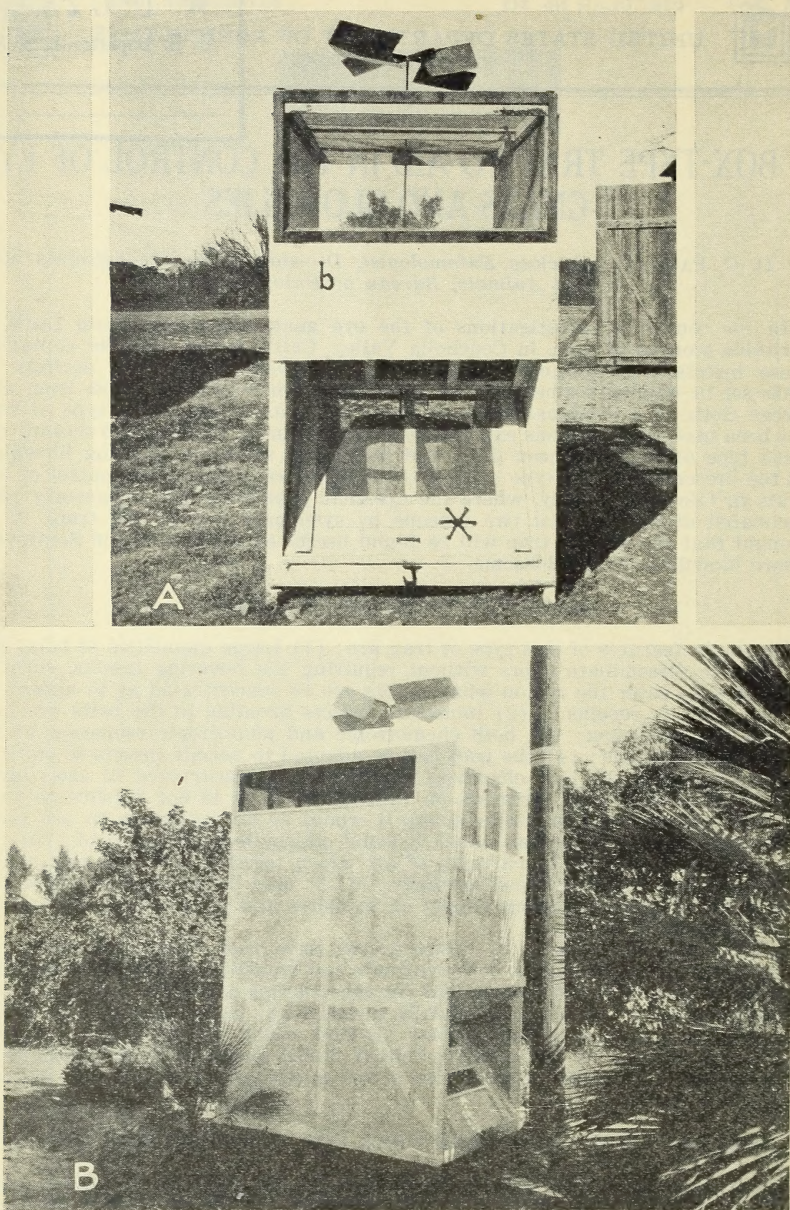


FIGURE 1.—A, Box-type fly trap, end view, with windmill bait agitator; B, box-type trap for eye gnats and blowflies



### CARCASS AND GARBAGE DISPOSAL TRAP

The carcass and garbage disposal trap is essentially the same as the other blowfly trap described except that it is larger, being 6 feet wide, 12 feet long, and 18 feet high, and has a concrete base and septic tank or cesspool connected with it, and should have an incinerator. The concrete approach is for sanitary purposes only. The concrete base for the trap is 6 inches deep and the side walls are 18 inches deep. The entrance boards are made to swing up, so that a truck can be backed into the trap and unloaded. A small side door is provided through which to dump small animals or garbage in small quantities.

### COST OF TRAPS

The cost of traps will differ widely according to size, prices of materials in different localities, the quality of materials used, and the price of labor for construction. The blowfly trap described in the mimeographed circular mentioned above required 176 board feet of No. 1 common pine lumber, 81 square feet of 12 and 14 mesh galvanized screen, and hardware. The total cost of materials was \$10.31 at Uvalde, Tex.; carpenter work required was eight hours, at \$1 per hour; a blacksmith furnished the materials and made the bait agitator for \$3; and the total cost amounted to \$21.31. The cost of applying two coats of paint could not be definitely established. A trap of the same size was constructed on a ranch by two carpenters in three and one-half hours; they used lumber taken from a building that was being remodeled. The trap has been in use two seasons, and has frequently been moved about over the ranch. It is still in first-class condition and has been very satisfactory to the owner.

The eye-gnat traps require much more labor than the fly traps, and must be of high-class workmanship to be satisfactory. For this reason they are rather expensive. The materials must be of a grade that can be worked into very close fitting joints and all joints must be thoroughly puttied and painted. The labor required on the trap illustrated in Figure 1, B, was 42.5 hours; the materials cost \$29.73; and the bait agitator cost \$3.40. The total cost of the trap at Coachella, Calif., was \$75.63.

The cost of each item of the carcass and garbage disposal trap is not known, but the total cost of the trap, septic tank, and connections was approximately \$153 at Menard, Tex.

### LOCATING AND BAITING TRAPS

The traps are intended to attract insects from a considerable distance and for this reason they should not be located in such situations as closed coves or canyons, places surrounded by high thick hedges, or buildings, or close beside such hedges or buildings. Neither should they be exposed to high winds. The most suitable locations are in open groves or thin plantings of trees or shrubs, such as vineyards, young citrus orchards, date-palm plantings, and on range having a moderate low growth or open high timber. The traps must always be set so that one of the two entrances will face away from the prevailing winds and never sidewise to these winds.

The blowfly traps are intended to be used in conjunction with other remedial measures in the control of the screw-worm flies on ranges. They were designed to accommodate a larger bait than other traps commonly used, in order that whole carcasses of animals could be utilized without the disagreeable task of cutting them into small baits. The trap illustrated in Figure 1, A, will accommodate carcasses of sheep, goats, coyotes, small calves, and other animals up to a maximum weight of 100 pounds. The large concrete-base trap will utilize all sizes of carcasses up to a total weight of about 3,000 pounds or to total contents of 200 cubic feet. The best catches of flies are made when the baits are partly or wholly covered with water; and where enough water is used to float the baits, the windmill bait agitator has proved advantageous. When water is used it has generally been found advantageous to add, as a larvicide, a teaspoonful of nicotine sulphate per gallon of water. This must not be done if the trap is to be used to breed a continuous supply of parasites of the larvae and pupae of flies.

The bait for the eye-gnat trap described has usually been 1 pound of beef or hog liver and 2 ounces of urea to 4 gallons of water. From 20 to 30 gallons of



the bait is used, water being added as it evaporates. The size of the trap will govern the quantity of bait to be used and for the present it appears that 1 pint of bait to each cubic foot of the trap (inside measurements) is about the right proportion.

### EFFICIENCY OF THE BOX-TYPE TRAPS

The first traps were constructed and tested for eye gnats in April, 1928. As has been stated, they were of glass in a wooden frame. After considerable experimental work in devising entrances and shapes, a trap was constructed that had essentially the same features as the traps mentioned here. It was 14 inches wide, 24 inches long, and 40 inches high. This trap took large numbers of eye gnats, but observations indicated that better results were obtained by darkening the lower part of the trap and placing a screen in the lower entrance board. From October 17 to 27, 1928, this trap captured approximately 378,000 eye gnats on a ranch in Coachella Valley, Calif. A larger trap was constructed (42 inches wide, 60 inches long, and 72 inches high), and from November 2 to 11, 1928, this trap captured about 988,000 eye gnats and 2½ gallons of flies of various species.

The work was continued through 1929 and 1930, and the present type of eye-gnat trap was designed in October, 1930, and tested during 15 months. It is believed that it will be suitable for use about schools and on ranches. Since it has been determined that practically 100 per cent of the gnats entering the traps are females capable of oviposition and that these may live in some cases for more than three weeks, it would appear that gnat breeding may be controlled to some extent by the use of these traps.

Several tests which were run with the box-type blowfly traps using a large amount of bait, in comparison with a number of the small cylindrical traps with inner cones using relatively smaller quantities of bait, indicate that for systematic range trapping the cone traps are superior. However, where but one trap can be maintained, the box-type trap should be very useful.

During the tests, parasites of blowfly larvae and pupae were found to breed in the trap, but not so freely as had been expected.

The large concrete-base carcass-disposal trap was constructed at Menard, Tex., March 13 and 14, 1930. The season's results for this trap were reported by letter from H. E. Parish, agent of the Bureau of Entomology, January 11, 1931. The total catch of flies for the period of March 30 to October 31, 1930, was 30 pounds 6 ounces, or 233.5 quarts. The amount of bait used was estimated at 4,368 pounds. The flies were emptied from the trap four times during the season. Of the total flies taken, 79.2 per cent were screw-worm flies, *Cochliomyia macellaria* Fab., and 14.3 per cent were black blowflies, *Phormia regina* Meig.

### CONCLUSIONS

Tests of box-type traps as described herein indicate that under certain conditions they may be of value in combating the screw-worm fly and other blowflies.

The large concrete-base traps may be used to dispose of carcasses and garbage in such a way as to make such refuse serve a useful purpose, especially where it is not feasible to destroy carcasses or ranch garbage otherwise.

The box-type trap may also be utilized to provide a continuous breeding place for some of the parasites and predators of blowfly larvae and pupae.

Data at hand indicate possibilities that this box-type trap will control the breeding of the eye gnat to some extent, as well as diminish appreciably the number of adult gnats.

The tests also indicate that a windmill bait agitator installed in the box-type trap may increase the catch of blowflies and does materially increase the catch of eye gnats.



